ABSTRACTS

(Papers read before the Institute but not published in the Proceedings.)

A Recent Volcanic Ash Deposit, Yukon Territory. A. R. Berger. Recent volcanic ash is found over a widespread area covering most of the southern part of the Yukon and extending into both Alaska and the Northwest Territories. It forms a conspicuous white layer close to the present ground surface with a maximum thickness of ten feet in the Upper White River basin. From the accompanying isopach map the ash is calculated to cover an area of 129,000 square miles comprising a total volume of 6 cubic miles which is equivalent to 1¾ cubic miles of solid rock. This deposit is due to a volcanic eruption from a center somewhere south of the Upper White River basin approximately 1700 years ago.

A petrographic examination of the pumice shows that it consists of zoned and unzoned plagioclases, soda-hornblende, and magnetite, in a matrix of glass. Optical determinations of the composition of the plagioclase indicate that this volcanic ash is andesitic. Some speculations on the mode of origin and petrogenesis of the ash are made with consideration of previous theories.

The Use of Nuclear Transfer Techniques in Radiation Studies. M. J. Ord. The object of this work was to locate the site of action of X-rays and a radiomimetic poison BB'dichlorodiethyl methyl amine (a nitrogen mustard) within the cell using the technique of nuclear transfers. With both treatments nuclei were shown to be more sensitive than cytoplasms and it was further found that control nuclei could be damaged by contact with treated cytoplasm. Nuclear damage led to many division irregularities.

Observations on the Development of Ciona Intestinalis. L. G. Bell. The tadpole larva of the sea squirts is thought to be one of the forms which may have given rise to the vertebrates. The development and metamorphosis of the larva of Ciona was described, together with culture techniques. Evidence that function is independent of structure in the tail muscles was presented. The structure of the muscles was illustrated. An abnormality of development induced by phenyl thiourea was described as well as experiments attempting to analyse this action.

Formation of Free Fatty Acids in Frozen Fish. W. J. Dyer, D. I. Fraser and E. G. Bligh. The formaton of free fatty acid in several species of fish fillets during frozen storage is reported. The increase was rapid in some non-fatty species, as cod, and very slow in some of the fatty species, like rosefish. This correlated well with taste panel and protein extractability assessments of deterioration during storage. The lipids of stored cod fillets were separated chromatographically and tentative identification has been made. The probable precursors of the fatty acids are discussed.

Vibration Spectrum of Vanadium by Neutron Spectrometry. A. T. Stewart and B. N. Brockhouse. The vibration spectra of a body centered cubic metal, vanadium, has been determined by neutron spectrometry. Incident neutrons of mean energy of 3.95×10^{-3} ev. were obtained by a filter difference technique using beryllium and lead filters. The energy distribution of neutrons scattered at 90° was measured by a chopper time of flight apparatus. The vibration spectrum obtained from

these measurements for vanadium agrees, at low frequencies, with low temperature specific heat measurements. The spectrum shows two peaks at frequencies of about 4.8 and 6.5×10^{12} sec. $^{-1}$ and a sharp cut-off at $7.5 = 0.3 \times 10^{-12}$ sec. $^{-1}$.

CORRELATIONS AFFECTING REGENERATION AND REACTIVATION IN SPLACHNUM AMPULLACEUM (L.) HEDW. I. G. MACQUARRIE and K. E. VON MALTZAHN. Restitutional processes generally occur only to a small extent in whole intact moss plants. Isolation of parts of the gemetophore leads to a realization of restitutional potentialities. This indicates that a system of correlations inhibits restitution in the whole moss plant. This study is concerned with the distribution of correlative factors and a possible mechanism of correlative inhibition in the moss plant.

Apical dominance is found to be present both in terms of regeneration and reactivation. Correlative inhibition is shown to be present within the stem and the leaf. A particularly strong inhibitory influence of stem on leaf regeneration exists. By means of this latter system it is demonstrated that isolation is the most important factor bringing about restitution while wounding is of little consequence.

Experiments with auxin and antiauxin indicate that correlative inhibition of regeneration is probably not controlled by a hormonal mechanism. Nutritional factors do not seem to be decisive either. Auxin did show, however, a great effect on reactivation in the plant.

While it is shown that isolation results in the removal of inhibitory influences both on regeneration and reactivation, the problem of the mechanism of correlative inhibition of restitution in the moss plant remains an open one.

PROETEIN AND CARBOHYDRATE METABOLISM IN VITAMIN B_6 DEFICIENCY. W. W. HAWKINS, VERNA G. LEONARD, and CAROL MARIE DICKS. Young rats were deprived of vitamin B_6 until the rate of growth became significantly affected. At this stage, when compared to controls, the vitamin-deficient animals excreted a larger proportion of the ingested nitrogen, the increase being in the urea fraction. They also sometimes showed a higher level of glucose in the blood, and typically a decreased glucose tolerance, as manifested by persistently higher levels after intraperitoneal test doses.

THE PRESENT STATE OF CHEMICAL MUTATION RESEARCH. AUERBACH, CHARLOTTE. (Institute of Animal Genetics, Edinburgh, Scotland). The first chemical mutagens were discovered at the beginning of the Second World War. Since then a great number of chemicals have been found to produce mutations. Many of them are carcinostatic agents, and a number have been found to be carcinogenic as well as carcinostatic. This twofold action of mutagens in regard to malignant growth is paralleled by a twofold action on the genetic material: the production of gene mutations, certain types of which may conceivably result in cancer, and the production of chromosome breaks, many of which certainly result in the death of dividing cells, and through this, in inhibition of tumour growth. Substances of this kind are often called radiomimetic , but this term has to be taken with more than a grain of salt. It is true that the nuclear effects of these chemicals are strikingly similar

to those of X-rays, but this may in great part be due to the limited responses of which the genetic material is capable. Moreover, there are some marked differences between the effects of chemical mutagens and of X-rays. The most fundamental difference is the high frequency of delayed mutation or chromosome breakage after chemical treatment. This is at least in part responsible for a second difference: the relative shortage of large chromosome rearrangements, in particular translocations, after chemical treatment. That this is not simply caused by a shortage of chromosome breaks is indicated by several findings: the high frequency of dominant lethals, the prevalence of intrachromosomal as opposed to interchromosomal rearrangements, and the frequency of small deletions and duplications which even exceeds that produced by X-rays.

There is little evidence to show whether chemical mutagens are radiomimetic in the mechanism of their action. The existence of these substances has been used to discredit the "hit"-theory of radiation mutagenesis, but this is not justified. It is, on the contrary, possible that some of the more drastic mutagens may resemble X-rays in being "hit"-poisons. Experimental evidence for this possibility is scarce and is difficult to obtain, but there are theoretical reasons for assuming that it may be so. Hydrogen perioxide and organic peroxide are probably closely radiomimetic in their chemical action, since they are also implicated as intermediates in radiation mutagenesis. Mutagenic purines, on the other hand, act differently from X-rays, since they are counteracted by anti-mutagens which are without effect in radiation mutagenesis. Since these antimutagens also diminish the frequency of spontaneous mutations in bacteria, mutagenic purines form a link between chemically induced and naturally occurring mutations. It is often assumed that all mutagens act at cell division by interfering with synthesis of deoxyribonucleic acid, but this is not so for a number of mutagens which produce their effects on resting spermatozoa. Special interest attaches to experiments in which mutagens were found to affect different gene loci to different degrees. From a practical point of view, this may be the first step to the controlled production of desirable variants in industrial microbiology and agriculture. Theoretically, these results may throw light on either the chemical nature of the genetic material or the processes which intervene between a chemical stimulus to a gene and the emergence of a mutated cell.

THE CHEMICAL COMPOSITION OF SEA WATER IN THE VICINITY OF THE ATLANTIC PROVINCES OF CANADA. E. GORDON YOUNG AND W. M. LANGILLE. Samples of sea water from eight locations at the surface around the coast of the Atlantic Provinces of Canada have been analyzed for their contents of major and minor constituents. The salt water in the Bras d'Or Lakes of Cape Breton Island, N. S., was very different from that in the contiguous Atlantic Ocean and showed evidence of much dilution. The chlorinities and salinities of other samples were relatively low and averaged 17.17 °/₀₀ and 31.03 °/₀₀ respectively. The average composition of sea water for this area was as follows in gm. per kgm.; Na 9.55, K 0.34, Ca 0.37, Mg 1.15, SO_4 2.36, $B(H_3BO_3)$ 0.017. Levels of the trace elements in μgm. per 1. varied within the following limits: As (As_2O_3) 1.4 - 2.0, Co 0.33 - 0.67, Cu 13 - 22, F 860 - 1200, I 6 - 53, Mo 6.3 - 14.0, PO_4 5 - 69, Si 44 - 95, Zn 6.5 - 10.9. Nickel was also present in all samples but vanadium was not detected. The various ratios of the mineral elements, especially to chlorine, have been calculated, and show only slight divergence from those for ocean waters.

PHYSICAL OCEANOGRAPHY OF THE COASTAL WATERS OFF HALIFAX. R. E. BANKS. Distributions of temperature, salinity and density based upon data from four cruises are shown and discussed. Relative currents are computed from the density field by means of the geostrophic equation. The current pattern is variable in detail but shows a persistent southwestward flow having maximum speeds 20 to 50 cm/sec.

ON THE EXTRACTION OF MYOSIN FROM COD MUSCLE WITH POTASSIUM IODIDE SOLUTIONS. J. R. DINGLE. Fisheries Research Board. The standard method used for extraction of myosin from muscle was not successful when applied to fish muscle. Recourse was had to extraction with potassium iodide solutions, first used by A. G. Szent-Gyorgyi. A protein was isolated from these extracts that had some of the properties to be expected for myosin when examined by electrophoresis, sedimentation, viscosity, and solubility. It resembled myosins prepared from other cold-blooded animals by other methods, and like them, differed from rabbit myosin in sedimentation and solubility behaviour. By adding adenosinetriphosphate to the extracting solutions it was possible to prepare a protein that appeared to be actin.

PULSE SHAPES PRODUCED BY UNDERWATER ACOUSTIC PROJECTORS. A. MOHAMMED. Using the concept of an electrical equivalent circuit the behaviour of transducers when excited by short pulses of sinusoidal voltages has been theoretically calculated. Comparison is made between the theoretical results and the experimental work carried out with a 30 Kc barium titanate transducer.

EFFECT OF AGAR ON THE GROWTH OF BACTERIA. W. YAPHE. Robbins (Mycologia 43, 11, 1955) showed that acid hydrolyzed agar inhibited the growth of a number of micro-organisms including *E. coli*. However the inhibitory agent was not isolated. In the present study the products of acid hydrolysis were separated by paper chromatography. Under conditions of mild acid hydrolysis a homologous series of oligosaccharides was obtained. The $R_{gal.}$ values for oligosaccharides from acid hydrolysates differed from those obtained from enzyme hydrolysates of agar. Results are in agreement with the structure of agar. Araki (Bull. Chem. Soc. Japan 29, 339 1956) showed that agar consists of repeating units of 1, 3 linked β -D-galactopyranose, 1, 4 linked 3, 6 anhydro-α-L-galactopyranose. Disaccharides agarobiose and neoagarobiose being obtained from acid and enzyme hydrolysates of agar.

The 3, 6 anhydro-α-L-galactopyranose linkage was very sensitive to acid hydrolysis and the 2, 6 anhydro-L-galactose was hydrolyzed to hydroxymethyl furfuraldehyde (H.M.F.), formic and levulinic acid.

Agar was hydrolyzed with oxalic acid under conditions which favoured the production of H.M.F. from 3, 6 anhydro-L-galactose and which did not hydrolyze galactose. The U.V. spectrum of the hydrolysate was similar to that of H.M.F. The effect on the growth of *E. coli* of oxalic acid hydrolyzed agar, oxalic acid hydrolyzed galactose, H.M.F. and enzyme hydrolyzed agar was determined. The results indicated that the inhibitory effect of acid hydrolyzed agar was due in part to H.M.F. which was formed from the 3, 6 anhydro-L-galactose constituent of agar.

PHOTOSYNTHESIS IN MARINE ALGAE. R. G. S. BIDWELL. Red, brown and green marine algae were supplied with $C^{14}O_2$ in light and the products of photosynthesis were examined by chromatography. The three groups each produced a different and characteristic group of soluble compounds. The browns produced mainly mannitol, a sugar alcohol; the reds produced either floridoside, which is a glycerol galactoside, or a new glycerol mannoside; and the greens were similar to land plants in producing mainly sucrose. No such distinct patterns emerged in the free amino acids or the proteins.

A more detailed examination of the brown seaweed, *Fucus vesiculosus*, showed that the main insoluble product of photosynthesis was alginic acid. Some radioactive fucoidin was also produced. There is evidence that both alginic acid and combined fucose are present in two distinct physiological, and possibly chemical, forms.

THE INFLUENCE OF pH ON THE INTRACELLULAR CONCENTRATION OF CITRATE IN YEAST. J. G. ALDOUS AND G. C. JOLLYMORE. Extracellular hydrogen ion concentration has previously been shown to exert qualitative changes in the intracellular metabolism of glucose. Evidence for this conclusion was based upon qualitative and quantitative aspects of the respiratory activity of the cell.

In the present phase of the investigation, cells which had been exposed to various environmental conditions were analyzed for their content of one of the metabolites of glucose, namely, citric acid. The results are in accord with the respiratory data and suggest that under acidic conditions, the cell utilizes the tricarboxylic acid cycle as a pathway for metabolizing glucose; but under more neutral environmental conditions, this pathway ceases to function and some alternate route is brought into play.

A SIMPLE GAS CHROMATOGRAPHY APPARATUS AND ITS APPLICATION TO ANALYSES OF THE HIGHER FATTY ACIDS. R. G. ACKMAN.
The principles of gas chromatography are briefly discussed, with remarks on detectors and packing materials suitable for various applications.

A simple and rugged gas chromatography apparatus is described which was built, with the exception of a recorder, with ordinary laboratory facilities.

The use of this apparatus for the qualitative and quantitative analysis of certain mixtures of fatty acids is described and illustrated with sample curves.

THE SEPARATION OF SIGNALS FROM INTERFERENCE BY MEANS OF A LINEAR FILTER. M. R. MCKAY AND H. S. HEAPS. Some of the most important problems encountered in the communication of information relate to the determination of the best possible method of processing the received signal plus interference so that the signal may be easily separated from the interference.

In many instances the signal is received as an electrical pulse and the interference appears as background noise. The classical design of filter circuits dealing with a continuous signal has been replaced in recent years by the design of processing networks producing an instantaneous value of signal as large as possible in comparison to the background noise. Of more practical interest is the design of networks to increase the signal to noise ratio over a sufficiently large time.

The present paper describes the results of a theoretical analysis to determine the effect of the best possible processing network. It is shown that the existence of a certain mathematical function corresponds to a very simple physical requirement. For the case of a rectangular pulsed signal received upon white noise it has been found possible to design a very simple filter which produces a signal to noise ratio equal to 96% of the theoretical maximum.

THE ENTEROLIPOMICRON. C. B. WELD. In Gastroenterology 1954, Singer, Sporn, and Necheles, obtained chylomicron-like particles from jejunal Thiry loops of dogs. They named them Enterolipomicrons, and suggested they might have some bearing on the excretion of lipids from the body.

By inflating a small balloon in the mouth of Thiry loops and injecting warm saline above the balloon we have stimulated the loops to secretion and rhythmical contraction. The debris was removed from the fluid so obtained by slow centrifugation and the enterolipomicrons washed 3 times with saline at 12,000 G. The enterolipomicron is found to differ from the chylimicron as follows:

1) The enterolipomicrons sediment on centrifuging in saline or plasma.

2) They consist of approximately 40% total lipid, and 60% protein. The lipid fraction contains about 16% phospholipid (expressed as lecithin), and 6.5% total cholesterol. (Corresponding figures for chylomicrons are 90% lipid, 10% protein, 5.2% lecithin, and 1.5% cholesterol).

3) They are not cleared by heparin clearing factor or by pancreatic lipase.

4) They are obtained from fasting, lipemic or heparinized dogs, and the yield and composition is not greatly different under these three conditions.

The yield of enterolipomicron is much greater in the first few minutes of stimulation, and within 10 or 15 minutes falls to a very low level. During the first few minutes most of the solid debris comes out from the loop; this is washed out of the loop with difficulty unless the loop is showing peristaltic activity and active secretion. With repeated washing of the debris after it is obtained, more and more enterolipomicrons are released and the composition of the debris reveals a slightly lower lipid content than the enterolipomicrons washed from it. For these reasons it is suggested that most of the particles are not secreted at the time but are performed and rinsed with the debris from the loop by the secreting mucosa.

THE *in vitro* CONVERSION OF C^{14}-ACETATE AND C^{14}-CHOLESTEROL TO ADRENOCORTICAL STEROIDS. E. G. BLIGH. This study concerned the biogenesis of adrenocortical steroids in a cell-free preparation of hog adrenals. The preparation utilized both acetate and cholesterol for the formation of corticosteroids. Incorporation of acetate into corticosteroids was not via cholesterol. Paper chromatographic analyses revealed that much larger quantities of the so-called "trace corticosteroids" are formed than heretofore recognized. The mechanism of corticosteroidogenesis is discussed on the basis of the specific radioactivities of the various steroids.

NEW FIELD TECHNIQUES IN PETROLEUM AND MINERAL EXPLORATION. H. L. CAMERON. Field work is preceded by intensive airphoto interpretation of the area to be done. An uncontrolled mosaic is used during field work for identification and orientation. It is supplemented by stereo examination of photos as field work proceeds. Notes are made by point identification on airphotos keyed field book notations. All field transport, other than reaching area, is by helicopter. Outcrops are checked from the air and on the ground. The costs and other factors are briefly discussed. Two areas are illustrated with helicopter photography.

THE RELATION OF RESPIRATORY TOLERANCE TO THE PRESENCE OF HAEMOGLOBIN IN GOLDFISH BLOOD. E. H. ANTHONY. The dependence of goldfish upon the presence of blood haemoglobin was examined by converting it to COHb (carbon monoxide haemoglobin). The fish were exposed to solutions through which various concentrations of CO were passed while the O_2 tension was kept at atmospheric level (20%). The concentrations of COHb were calculated from Roughton's measurement of the $COHb/O_2Hb$ partition coefficient for goldfish blood (span = 63; M = 63).

One goldfish at 30°C. survived over 24 hours in 80% CO; survival at lower temperatures is indefinitely longer. 20% CO is ample to induce formation of 99% COHb. It was concluded that CO is a valuable tool for studies of fish respiration, and it has been applied to asphyxiation experiments.

The use of CO has indicated:

1. Standard oxygen consumption is independent of Hb up to and possibly including 30°C.
2. Routine oxygen consumption is independent of Hb over part of the lower temperature range.
3. Removal of oxygen from water under asphyxial conditions is independent of the presence of Hb.

From these observations it is suggested that:

1. Haemoglobin in goldfish blood acts somewhat in the role of an emergency supercharger. This is probably so for other species.
2. The conclusion of previous workers, based on asphyxiation experiments, that CO_2 has an effect upon chemical transport.

VALLEY ABSTRACTS

THE INFLUENCE OF INSECTS ON THE FLORISTIC COMPOSITION OF GRASSLAND. C. J. S. FOX. Crop Insect Section, Science Service Laboratory, Kentville, Nova Scotia. The concept that tree infesting insects are capable of changing the composition f forest stands has been recognized for decades but the same principle applied to grassland has not been clearly stated. Evidence is given that insects do alter the floristic composition of grassland. The alteration has been most obvious and catastrophic where root-feeding, exotic insects are involved, but probably more gradual changes are caused by native insects feeding on native or introduced plants. Long-term studies would be necessary to evaluate the latter less perceptible changes. It is suggested that insects as a factor in grassland succession deserve more attention than they have received.

COLOR OF PREDACIOUS MITES AFTER FEEDING ON MITE PREY IN THE LABORATORY. JUNE HERBERT. Entomology Laboratory, Kentville, N. S. Little is known of the feeding habits of the species of predacious mites belonging to the sub-family Phytoseiinae. In a series of laboratory studies, it was observed the gut takes on a characteristic color after feeding on the mite prey. Since these colors cannot be easily described phytographs were made. In the laboratory four species of phytoseiids were fed various stages of the following prey: *Metatetranychus ulmi* (Koch), *Bryobia praetiosa* (Koch), *Tetranychus telarius* (Linn.) and *Vasates schlechtendali* (Nal.).

SURVEY OF WILD STRAWBERRIES OF NOVA SCOTIA FOR VIRUS INFECTION. JOAN MCGOWAN. Strawberry plants growing wild in fifteen areas of Nova Scotia were collected and grafted to *Fragaria vesca*, East Malling strain, in order to determine the extent of virus infection in such plants. About 20% of the sites investigated contained plants infected with a virus, and about 10% of the plants checked were found to be infected. These tended to be concentrated in a few areas and many are escapes from cultivated fields.

VARIATIONS IN POPULATION DENSITY OF THE ACADIAN FIELD MOUSE IN ANNAPOLIS VALLEY APPLE ORCHARDS. H. T. STULTZ. During the latter part of October each year, 1947 to 1957, a large number of representative apple orchard ground covers throughout the area were examined and graded for signs of recent mouse activity. Beginning in 1951 an average of 109 ground covers were thus sampled annually. A number of trap-lines were also run each year. While the surveys were conducted primarily with the object of providing forecast data for the benefit of fruit-growers the results are also pertinent to the study of animal population dynamics, particularly socalled cyclic phenomena. The results obtained to date do not support the concept that field mouse populations exhibit a four-year cycle or any other cyclic period, either for the Annapolis Valley as a whole or for individual check points. Marked fluctuations in population were recorded for individual check points. It was not unusual for synchronous fluctuations to occur at all or most check points within a particular district. For the area as a whole, however, the high and low population levels of a varying proportion of the check points or districts were completely out of phase with one another. This suggests the absence of a widespread biotic causal factor acting outside of local biological systems. The results therefore support the premise that the most fruitful approach to an understanding of the population dynamics of field mice is through a study of their biology.

THE PARTIAL EXCAVATION OF NINE PREHISTORIC CAMP-SITES IN THE SOUTHWESTERN PART OF NOVA SCOTIA. J. S. ERSKINE, Wolfville, N. S. During the summer of 1957 an exploration of prehistoric sites was begun for the Nova Scotia Museum of Science. The Port Joli area in Queens and Shelburne Counties, where many small shell-heaps were known, was chosen as a place to establish norms for future comparisons. Five shell-heaps were partially excavated, and the findings of artifacts, pottery, stone chips and bones were collected and compared statistically.

The Fundy Shore was next examined and sites were sampled at Lequille, Annapolis County, and Bear River. The general resemblance of these to the South Shore sites was close. Salmon-fishing stations at

Pleasant Lake and Tusket Falls, Yarmouth County, were visited, but small-scale excavation was not practical at either.

The great salmon-fishing station at Indian Gardens on the Mersey River, Queens County, was visited and two partially eroded sites were dug. One was entirely pre-European; the other showed a mixture of pottery and arrowheads and a hearth of Woodland type, with intermingled fragments of chinaware, clay pipes, wrought-iron nails, a white bead, and a Nova Scotian halfpenny token of 1832.

The total picture is of a single Woodland culture continuing from pre-European days until the last century. The much more varied stone-chipping and grinding from the eroded salmon-fishing station at Indian Gardens needs both dating and explanation.

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